

CLAIMS

1. An optical-disk recording apparatus for recording data in a data recording field of an optical disk having a sector structure constituted of a header field (1002) previously storing address information and a data recording field (1003) for storing data, in which the header field includes an address mark field (AM) storing an address mark showing a beginning of address information, an address information field (PID) storing address information, and an error detection code field (IED) storing an error detection code for detecting an error in the address information field, said apparatus comprising:

means (111) for detecting an address mark stored in the address mark field of the sector; and

means (110, 113, 114) for deciding and controlling a period of recording data in the data recording field (1003) of the sector, wherein said data-recording decision and control means uses an address-mark detection timing (AMDP) of the address-mark detection means (111) in the decision and control of the data recording period.

2. The optical-disk recording apparatus according to claim 1, wherein said data-recording decision and control means (110, 113, 114) includes: address-information error detection means (113) for detecting presence or absence of an error in the address-information based on the address information and the error detection code; and timing generation means (114) for generating a recording timing signal (WGS and ENBL) for deciding a data recording operation by using the timing (AMDP) of

values (A to H) at the timing (AMDP) of detecting the address mark by the address-mark detection means (111) and the timing (CRCOK) of detecting that there is no error in the address information by the address-information-error detection means (113); and

decoding means (203, 403) for decoding the count output (CTO) by the counting means (202, 402) corrected with the predetermined values to thereby produce the recording-timing signals (WGS, ENBL).

5. The optical-disk recording apparatus according to claim 4, wherein said decoding means (403) decodes the count output of the counting means (402) to generate an address-mark detection window (AMDWNS), and permits the counted-value correction means (404) to correct the counted value when the address-mark detection timing (AMDP; AMDP-b, -c, and -d) detected by the address-mark detection means (111) is present within the address-mark detection window (AMDWNS), and inhibits the counted-value correction means (404) to correct the counted value when the address-mark detection timing (AMDP; AMDP-a) is present outside the address-mark detection window (AMDNWS).

6. The optical-disk recording apparatus according to claim 4, wherein the header field (1002) in each sector includes a plurality of address fields (1004a to 1004d) each having an address mark field (AM), an address information field (PID), and an error detection code field (IED), and when it is detected that there is no error in the address

information in at least one address field in each sector (OK-c), the timing generation means (114) inhibits the counted-value correction means (204) to correct the counted value even if an address mark is detected (AMDP-d) in the subsequent address fields thereafter in the subject sector.

7. An optical-disk reproducing apparatus for reproducing data from a data recording field of an optical disk having a sector structure constituted of a header field (1002) previously storing address information and a data recording field (1003) for storing data, in which the header field includes an address mark field (AM) storing an address mark showing a beginning of address information, an address information field (PID) storing address information, and an error detection code field (IED) storing an error detection code for detecting an error in the address information field, said apparatus comprising:

means (111) for detecting an address mark stored in the address mark field (AM) of the sector; and

means (110, 113, 114) for deciding and controlling a period of reproducing data from the data recording field of the sector, wherein said data-reproducing decision and control means uses an address-mark detection timing (AMDP) of the address-mark detection means (111) in the decision and control of the data reproducing period.

8. The optical-disk reproducing apparatus according to claim 7, wherein said data-reproducing decision and control means (110, 113,

114) includes: address-information error detection means (113) for detecting presence or absence of an error in the address-information based on the address information and the error detection code; and timing generation means (114) for generating a reproducing timing signal (RGS, WNS) for deciding a data reproducing operation by using the address mark detection timing (AMDP) detected by the address-mark detection means (111) and the timing (CRCOK) detected by the address-information error detection means (113) of detecting that there is no error in the address information.

9. The optical-disk reproducing apparatus according to claim 8, wherein said data-reproducing decision and control means (110, 113, 114) permits data reproduction only in the following two cases when reproducing data from the data recording field of a predetermined sector:

(case 1) where address information having no error detected is obtained as a result of error detection in the subject sector executed by the address-information error detection means (113), and

(case 2) where at least one piece of address information having no error detected is obtained in a predetermined number of sectors preceding the subject sector as a result of error detection by the address-information-error detection means (113) and at least one address mark is detected in the address mark field of the subject sector.

10. The optical-disk reproducing apparatus according to claim 8, wherein said timing generation means (114) includes:

clock generation means (301, 401) for generating a reference clock serving as a criterion of reproducing data;

counting means (302, 402) for count-specifying a position in one sector by using the reference clock;

counted-value correction means (304, 404) for correcting the counted values of said counting means (302, 402) with predetermined values (A to H) at the timing (AMDP) of detecting the address mark by the address-mark detection means (111) and the timing (CRCOK) of detecting that there is no error in the address information by the address-information-error detection means (113); and

decoding means (303, 403) for decoding the count output (CTO) by the counting means (302, 402) corrected with the predetermined values to thereby produce the reproducing-timing signals (RGS, WNS).

11. The optical-disk reproducing apparatus according to claim 10, wherein said decoding means (403) decodes the count output of the counting means (402) to generate an address-mark detection window (AMDWNS), and permits the counted-value correction means (404) to correct the counted value when the address-mark detection timing (AMDP; AMDP-b, -c, and -d) detected by the address-mark detection means (111) is present within the address-mark detection window (AMDWNS), and inhibits the counted-value correction means (404) to correct the counted value when the address-mark detection timing

(AMDP; AMDP-a) is present outside the address-mark detection window (AMDNWS).

12. The optical-disk reproducing apparatus according to claim 10, wherein the header field (1002) in each sector includes a plurality of address fields (1004a to 1004d) each having an address mark field (AM), an address information field (PID), and an error detection code field (IED), and when it is detected that there is no error in the address information in at least one address field in each sector (OK-c), the timing generation means (114) inhibits the counted-value correction means (304) to correct the counted value even if an address mark is detected (AMDP-d) in the subsequent address fields thereafter in the subject sector.

13. An optical-disk recording method for recording data in a data recording field of an optical disk having a sector structure constituted of a header field (1002) previously storing address information and a data recording field (1003) for storing data, in which the header field includes an address mark field (AM) storing an address mark showing a beginning of address information, an address information field (PID) storing address information, and an error detection code field (IED) storing an error detection code for detecting an error in the address information field, said method comprising the steps of:

(case 2) where at least one piece of address information having no error detected is obtained in a predetermined number of sectors preceding the subject sector as a result of error detection and at least one address mark is detected in the address mark field of the subject sector.

16. The optical-disk recording method according to claim 14,
wherein said timing generation step (114) includes:

a step (201, 401) of generating a reference clock serving as a criterion of recording data;

a step (202, 402) of count-specifying a position in one sector by using the reference clock;

a step (204, 404) of correcting the counted values in said counting step with predetermined values (A to H) at the timing (AMDP) of detecting the address mark and the timing (CRCOK) of detecting that there is no error in the address information; and

a decoding step (203, 403) of decoding the counted value obtained in the counting step corrected with the predetermined values to thereby produce the recording-timing signals (WGS, ENBL).

17. The optical-disk recording method according to claim 16, wherein said decoding step (403) decodes the counted value obtained in the counting step (402) to generate an address-mark detection window (AMDWNS), and permits the correction of the counted value in the counted-value correction step (404) when the address-mark detection

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timing (AMDP; AMDP-b, -c, and -d) is present within the address-mark detection window (AMDWNS), and inhibits the correction of the counted value in the counted-value correction step (404) when the address-mark detection timing (AMDP; AMDP-a) is present outside the address-mark detection window (AMDNWS).

18. The optical-disk recording method according to claim 16, wherein the header field (1002) in each sector includes a plurality of address fields (1004a to 1004d) each having an address mark field (AM), an address information field (PID), and an error detection code field (IED), and when it is detected that there is no error in the address information in at least one address field in each sector (OK-c), the timing generation step (114) inhibits the correction of the counted value in the counted-value correction step (204) even if an address mark is detected (AMDP-d) in the subsequent address fields thereafter in the subject sector.

19. An optical-disk reproducing method for reproducing data from a data recording field of an optical disk having a sector structure constituted of a header field (1002) previously storing address information and a data recording field (1003) for storing data, in which the header field includes an address mark field (AM) storing an address mark showing a beginning of address information, an address information field (PID) storing address information, and an error detection code field (IED) storing an error detection code for detecting

an error in the address information field, said method comprising the steps of:

detecting (111) an address mark stored in the address mark field (AM) of the sector; and

deciding and controlling (110, 113, 114) a period of reproducing data from the data recording field of the sector, wherein the address-mark detection timing (AMDP) is used in the decision and control of the data reproducing period.

20. The optical-disk reproducing method according to claim 19, wherein said data-reproducing decision and control step (110, 113, 114) includes: a step (113) of detecting presence or absence of an error in the address-information based on the address information and the error detection code; and a step (114) of generating a reproducing timing signal (RGS, WNS) for deciding a data reproducing operation by using the address mark detection timing (AMDP) and the timing (CRCOK) of detecting that there is no error in the address information.

21. The optical-disk reproducing method according to claim 20, wherein said data-reproducing decision and control step (110, 113, 114) permits data reproduction only in the following two cases when reproducing data from the data recording field of a predetermined sector:

23. The optical-disk reproducing method according to claim 22, wherein said decoding step (403) decodes the counted value obtained in the counting step (402) to generate an address-mark detection window (AMDWNS), and permits the correction of the counted value in the counted-value correction step (404) when the address-mark detection timing (AMDP; AMDP-b, -c, and -d) is present within the address-mark detection window (AMDWNS), and inhibits the correction of the counted value in the counted-value correction step (404) when the address-mark detection timing (AMDP; AMDP-a) is present outside the address-mark detection window (AMDNWS).

24. The optical-disk reproducing method according to claim 22, wherein the header field (1002) in each sector includes a plurality of address fields (1004a to 1004d) each having an address mark field (AM), an address information field (PID), and an error detection code field (IED), and when it is detected that there is no error in the address information in at least one address field in each sector (OK-c), the timing generation means (114) inhibits the correction of the counted value in the counted-value correction step (304) even if an address mark is detected (AMDP-d) in the subsequent address fields thereafter in the subject sector.

25. An information recording system for recording information including transfer-rate-priority data and transfer-rate-nonpriority data in mixture supplied from an external unit (502) to an optical disk (101)

having a sector structure constituted of a header field (1002) previously storing address information and a data recording field (1003) for storing data, said system comprising:

an optical disk drive (501) for recording data to the data recording field in a predetermined sector of the optical disk; and

determination means (503, S1402, S1504) for determining whether the information to be recorded to the optical disk is transfer-rate-priority data (510) or transfer-rate-nonpriority data (511),

wherein when the information is the transfer-rate-priority data, the optical disk drive (501) records the information in the sector to record the data even if there are errors equal to or more than a predetermined criterion in address information in the sector to record the data (case 1403), and when the data is the transfer-rate-nonpriority data, the optical disk drive (501) records the data in a substitute sector without recording the data in the subject sector to record the data if there are errors equal to or more than the predetermined criterion in the subject sector (cases 1402 1503).

26. The information recording system according to claim 25, wherein the header field includes an address mark field (AM) storing an address mark showing a beginning of address information, an address information field (PID) storing address information, and an error detection code field (IED) storing an error detection code for detecting an error in the address information field, said system further comprising:

means (111, step S1501) for detecting an address mark recorded in the address mark field of the subject sector, and

means (110, 113, 114) for deciding and controlling a period of recording data to the data recording field (1003) of the subject sector, wherein the address-mark detection timing (AMDP) is used for decision and control of the data recording period.

27. The information recording system according to claim 26, wherein said data-recording decision and control means (110, 113, 114) includes: address-information error detecting means (113; steps S1401, S1502) for detecting presence or absence of an error in the address information based on the address information and the error detection code; and timing generation means (114) for generating a recording timing signal (WGS, ENBL) for deciding a data recording operation by using the address mark detection timing (AMDP) and the timing (CRCOK) of detecting that there is no error in the address information.

28. The information recording system according to claim 27, wherein said data-recording decision and control means (110, 113, 114) determines (S1402, S1504) whether or not the supplied data is the transfer-rate-priority data (510) in the following two cases when recording data in the data recording field of a predetermined sector:

(case 1) where address information having no error detected is obtained as a result of error detection in the subject sector executed in the address-information error detection step (113, step S1502), and

(case 2) where at least one piece of address information having no error detected is obtained in a predetermined number of sectors preceding the subject sector as a result of executing the address-information error detection and at least one address mark is detected (step S1503) in the address mark field of the subject sector.

29. The information recording system according to claim 25, wherein said data determination means (503, S1402, S1504) determines whether the information is transfer-rate-priority data or transfer-rate-nonpriority data by interpreting (S1601) whether a command is a command for handling the transfer-rate-priority data or a command for handling the transfer-rate-nonpriority data issued from an external unit (502) to the optical disk drive (501).

30. The information recording system according to claim 25, wherein said data determination means (503, S1402, S1504) determines whether the information is transfer-rate-priority data or transfer-rate-nonpriority data depending on the content of a set mode (S1701) set to the optical disk drive (501) from an external unit (502) whether the set mode is a mode for handling the transfer-rate-priority data or a mode for handling the transfer-rate-nonpriority data.

31. The information recording system according to claim 25, further comprising a file system (507) for filing the information to be handled wherein each file is provided with a file attribute showing

transfer-rate-priority data or not, and wherein said determination means determines transfer-rate-priority data or transfer-rate-nonpriority data in accordance with the fact that the attribute of each file provided by the file system shows transfer rate priority or transfer rate nonpriority.

32. An information recording method for recording data supplied from an external unit (502) in a data recording field of an optical disk (101) having a sector structure constituted of a header field (1002) previously storing address information and a data recording field (1003) for storing data, the method comprising:

a step (S1402, S1504) of determining whether the information to be recorded to the optical disk is transfer-rate-priority data (510) or not, and

a control step (Cases 1402, 1503) of recording the data in the sector to record the data even if there are errors equal to or more than a predetermined criterion in address information in the sector to record the data (Case 1403, Case 2) in the case of the transfer-rate-priority data, and recording the data in a substitute sector without recording the data in the subject sector to record the data if there are errors equal to or more than the predetermined criterion in the subject sector (cases 1402 1503) in case of the transfer-rate-nonpriority data.

33. The information recording method according to claim 32, wherein the header field includes an address mark field (AM) storing an

address mark showing a beginning of address information, an address information field (PID) storing address information, and an error detection code field (IED) storing an error detection code for detecting an error in the address information field, said method further comprising the steps of:

detecting (111, step S1501) an address mark recorded in the address mark field of the subject sector, and

deciding and controlling (110, 113, 114) a period of recording data to the data recording field (1003) of the subject sector, wherein the address-mark detection timing (AMDP) is used for decision and control of the data recording period.

34. The information recording method according to claim 33, wherein said data-recording decision and control step (110, 113, 114) includes: an address-information error detecting step (113; steps S1401, S1502) of detecting presence or absence of an error in the address-information based on the address information and the error detection code; and a timing generation step (114) of generating a recording timing signal (WGS, ENBL) for deciding a data recording operation by using the address mark detection timing (AMDP) and the timing (CRCOK) detected in the address-information error detecting step of detecting that there is no error in the address information.

35. The information recording method according to claim 34, wherein said data-recording decision and control step (110, 113, 114)

determines whether or not the supplied data is the transfer-rate-priority data (510) in the following two cases when recording data in the data recording field of a predetermined sector (S1402, S1504):

(case 1) where address information having no error detected is obtained as a result of error detection in the subject sector executed in the address-information error detection step (113, step S1502), and

(case 2) where at least one piece of address information having no error detected is obtained in a predetermined number of sectors preceding the subject sector as a result of executing the address-information error detection and at least one address mark is detected in the address mark field of the subject sector (step S1503).

36. The information recording method according to claim 32, wherein said data determination step (503, S1402, S1504) determines whether the information is transfer-rate-priority data or transfer-rate-nonpriority data by interpreting (S1601) whether a command is a command for handling the transfer-rate-priority data or a command for handling the transfer-rate-nonpriority data issued from an external unit (502) to the optical disk drive (501).

37. The information recording method according to claim 32, wherein said data determination step (503, S1402, S1504) determines whether the information is transfer-rate-priority data or transfer-rate-nonpriority data depending on the content of a set mode (S1701) set to the optical disk drive (501) from an external unit (502) whether the set

